

THE 1918 FLU PANDEMIC: IMPLICATIONS FOR HOMELAND SECURITY IN THE NEW MILLENNIUM

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USAWC PROGRAM RESEARCH PAPER

**THE 1918 FLU PANDEMIC:
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IN THE NEW MILLENNIUM**

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ABSTRACT

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The National Strategy for Pandemic Influenza notes that pandemic flu could overwhelm the health and medical capabilities of the United States, cause hundreds of thousands of deaths, millions of hospitalizations, and cost hundreds of billions of dollars. The consensus within scientific circles is that the nation will likely face one or more pandemics in this century, although there is disagreement as to the probable timing of such an event. Studying the 1918 pandemic will assist modern day planners in mitigating the effects of pandemic flu and the contingency planning will have widespread applicability to other events, both natural and manmade, that may significantly impact the nation's health and security. This paper reviews the 1918 pandemic, explores concerns about the avian influenza virus H5N1, and considers current planning for pandemic flu. Weaknesses in the current schema are examined and recommendations are offered to facilitate both enhanced pandemic planning efforts and Homeland Security.

THE 1918 FLU PANDEMIC: IMPLICATIONS FOR HOMELAND SECURITY IN THE NEW MILLENNIUM

The 1918 Flu Pandemic caused an estimated 50 million deaths worldwide and over 500,000 deaths in the United States alone.^{1 2} Almost 50,000 U.S. Servicemen died from the Spanish flu of 1918, many more than were killed on the battlefields of Europe during World War I.³ Experts in infectious disease are troubled by the similarities between the 1918 flu virus and a new threat of potentially much greater magnitude: the avian influenza strain commonly referred to as bird flu or as it is known in scientific circles, H5N1.⁴ If H5N1 caused a pandemic of proportions similar to those of 1918, the estimated death toll for Americans would be 1.7 million people.⁵ Death estimates worldwide ranges from 180-360 million with a disproportionate toll occurring in poor and less developed nations.⁶ A catastrophe of this magnitude would again cause humans to wonder, as was the case in 1918, if the end of the world was nigh.

The repercussions of a modern day pandemic would reverberate throughout U.S. society and the world. The economic cost would be enormous and the potential for civil unrest and political destabilization would be significant. Recognizing the need to prepare for such a possibility, the U. S. has developed and published a National Strategy for Pandemic Influenza.⁷ This essay briefly examines the 1918 pandemic; considers the pandemic potential of H5N1 in light of the historical context, and assess U.S. planning for pandemic influenza. The potential for a flu pandemic must not be underestimated. Current planning efforts should receive higher priority and preferential funding.

In 1918 the United States was a young and vibrant nation ready to help end the war in Europe and usher the world into a new age. What no one could predict however was the coming scourge of pandemic flu. Stedman's Medical dictionary notes that an

epidemic is, “A disease attacking many in a community simultaneously” or “A temporary increase in number of cases...”⁸ Pandemic is defined by the same source as, “Denoting a disease affecting or attacking in the population of an extensive region; extensively epidemic.”⁹ With most all resources noting the usual 50 million figure for death estimates of the pandemic, and some noting that the actual toll could well have been as high as 100 million, there is no doubt that the term pandemic is an accurate description of what happened in the US at home and the world at large in 1918.¹⁰

In retrospect there are data suggesting that there might have been some early warning to the U.S. and the world with infections noted in some of the military camps of World War I and there is general agreement that the pandemic occurred in three waves.¹¹ The initial wave of the influenza hit in March of 1918 at Fort Riley, Kansas.¹² The troops there burned tons of manure, so much so that descriptions of the event noted that the sky was black.¹³ Two days later a young and healthy soldier reported to the post hospital with a fever.¹⁴ By noon that day, March 11, over 100 cases were noted and by the week’s end the number had risen to 500.¹⁵ Eventually 48 soldiers died of the illness that was originally thought to be some kind of pneumonia.¹⁶ Many believed it came about as a result of the toxic plume from the manure fires, but no one expected it to be the first wave of pandemic flu.¹⁷ Of particular importance in this event is that the victims were young, in the prime of life and in seemingly good health. Such facts were not coincidental and indeed later were learned to be a hallmark of the virulent 1918 virus.¹⁸

The second wave of flu hit in the fall of 1918 and spread worldwide during September, October and November.¹⁹ The recurrent outbreak in the U.S. seemed to arrive in Boston, found many victims and easily spread though the seaport busy with

war shipments.²⁰ Continued mobilization for the Great War encouraged spread of the disease and the Armistice Day celebrations allowed the virus to rebound in communities that had otherwise noted a reduction in cases.²¹

Finally, in early 1919, many nations experienced a third wave of flu and experts estimated that twenty percent of the world's population had been infected with influenza.²² Death was most common in wave two and three with a fulminate and fatal pneumonia being the hallmark of these cases. Why the flu behaved in a cyclic manner with such extreme mortality and over such a short period of time remains unknown despite extensive research.²³

Physicians, with their ranks decimated by illness and with the number of civilian doctors thinned even more by conscription, worked endlessly to aid the ill and dying and in trying to find the causative agent of this deadly scourge.^{24 25} The causative viral particles were so small that they could not be seen by the technology of the day and, consequently, there were a few bizarre theories as to the causative agent or agents. Some suspected that the flu was actually a biological agent used by the Germans and one practitioner worried that the Bayer Company may even be spreading the disease through oral aspirin tablets.²⁶ Popular remedies included camphor balls hung around the neck in a small bag, a few drops of turpentine or kerosene on sugar and even physicians often recommended courses of treatment of dubious value.²⁷

The speed with which the illness moved was unprecedented. Physicians were absolutely dumfounded by a disease that caused a patient to present with symptoms that were relentlessly progressive resulting in death within twelve hours of first presentation. The death toll for October 1918 in the U.S. was nearly 200,000 dead and Dr. Victor Vaughn who was the Acting Surgeon General of the Army estimated that if

the disease continued its march at such a pace that the end of civilization was in sight.²⁸ Caskets were in short supply, graves were being dug with steam shovels, and children were left homeless by an illness that took parents.²⁹ Indeed, the end did seem near.

Then, for unclear reasons, the flu began to moderate and the month of November showed a remarkable decline in cases.³⁰ Experts in epidemiology attribute at least part of the decline to the fact that those susceptible to the illness had all died thereby leaving the bug with few left to infect.³¹ Other factors included the development of immunity in survivors and perhaps some herd immunity was beginning to develop. With the Germans defeated, the Armistice signed, and the flu tapering off, many felt the worst was over. Of course the lasting impact of lives lost and a sense of vulnerability remained, but surprisingly there would be little institutional memory of such a horrific event.

Flu is known to occur in epidemic cycles and while it remains a deadly infectious disease, no flu since 1918 has been anywhere near as virulent.³² The epidemics of 1957-58 and 1968-69 did kill thousands of Americans and infected many others.³³ In comparison with the carnage of 1918, however, experts consider these more recent epidemics as “mild.” Perhaps the experience with the 1957 and 1968 epidemics and the near panic over the possible swine flu epidemic of 1976 that was widely predicted, but never developed, has led to a level of complacency that has compromised U.S. national security.³⁴ Such complacency has recently been disturbed by a new strain of influenza that has an unnerving similarity to the plague-like strain of 1918.

There have been other changes in America and the world since 1918 that would likely make a highly contagious and virulent infectious agent even more deadly. Just as computer viruses spread via the connectivity of computers all over the world through the

internet, the globalization of today's world would make transmission of a human infective agent a given rather than a mere possibility. And with the interconnected needs of the current global economy even if death was not an issue, the crippling of the work force for an extended period of time would cause great disruption to economies internationally.³⁵ Those who argue that a “cold” would not stop a global workforce have never experienced the flu; those who have experienced the flu get the vaccine and get it yearly. The physical illness of influenza is acutely debilitating and contagious as well. Such a combination results in absenteeism of those who are sick as well as those who fear sickness.

Some argue that much of the world's business can be conducted remotely with the aid of computers and therefore, while productivity will be impaired, the potential for catastrophic disruption is less likely. Further, many businesses report they are making plans to deal with pandemic flu by allowing just such activity. The problem here is that such arrangements may have to be in place for 12-36 months in the case of a worldwide pandemic.³⁶ The current level of planning is not likely to support such an extended disruption.

Experts often look to the past to help predict the future and to the recent past to make decisions in the near term. The closest thing in the recent past that may mimic the potential of pandemic flu was the SARS or Severe Acute Respiratory Syndrome crisis that occurred in 2003 after the virus appeared in rural China. Michael Osterholm notes that SARS, unlike influenza, had a relatively low transmission rate; nonetheless, this agent spread to five nations within one 24 hour period and to 30 nations on six separate land masses within a few months.³⁷ All of this transmission occurred despite a concerted effort by authorities to limit contagion. The good news was that only about

8000 patients developed SARS; the bad news was a fatality rate of approximately 10 percent.³⁸

What may be more enlightening to some is the estimated economic impact of the SARS episode. Osterholm quotes research from Korea University and the Australian National University estimating the impact of SARS on the Asia-Pacific region at about \$40 billion.³⁹ Canada had an outbreak attributed to a single infected traveler from Hong Kong resulting in over 400 cases, over 40 deaths, with an estimated cost to the nation in hundreds of millions of dollars.⁴⁰ All of these events occurred due to an outbreak of a novel infectious agent in an epidemic that lasted six months. Again, most experts feel an influenza epidemic would last 2-3 times as long or longer.

Interest in infectious disease and a potential flu pandemic in particular, has been high among researchers for years as they understand that infectious disease is still the number one killer of human beings in the world.⁴¹ The Centers for Disease Control and Prevention estimate that a normal flu season will hospitalize about 200,000 Americans and that nearly 40,000 of them will die.⁴² While these numbers are staggering, other diseases have much higher tolls in the world at large. Nearly 40 million people worldwide are infected with the AIDS virus and millions die each year.⁴³ Early this century, nearly 9 million were infected with tuberculosis and more than 2 million of those patients died; and malaria, a disease that most Americans have little knowledge of killed over 1 million.⁴⁴ These data do not include the other myriad illnesses and diseases that are caused by infectious agents that may maim and debilitate, but do not kill.

Many of these illnesses are readily treatable and patients return to full and productive lives. But, there is still a significant cost associated with these illnesses due to decreased and lost worker productivity and the substantial cost of medical and

nursing care to treat these illnesses. Laurie Garrett estimates that the “routine” U.S. flu season, like that mentioned in the foregoing paragraph, will cost the U.S. economy an estimated \$12 billion annually when all of costs are considered.⁴⁵ It is important to remember that the typical victim of the flu these days is characteristically someone who is very young, very old, or afflicted with a chronic illness; in other words, the victims are not the most productive members of society. In considering the potential impact of a 1918 pandemic version of the flu, groups most affected by that contagion were those in their most productive years.⁴⁶

Scientists have continued to study the 1918 virus in an effort to identify the unique characteristics that made it so lethal. In order to better understand the virus, the bug has been returned to life using careful laboratory control techniques and archival autopsy tissues. Jeffery K. Taubenberger and colleagues have recently sequenced the entire genome of the deadly 1918 virus completing research that started with the 1995 identification of autopsy material from lungs that had been originally collected in the fall of 1918.⁴⁷ One of the early findings revealed that essentially all flu viruses in circulation today represent genetic offspring of the 1918 virus, but it seems clear that the appearance of the virus in 1918 represented a novel event. That is, this particular virus had never before been seen by the human immune system and, therefore, there was no immunity present in the population. Further the research reveals that the 1918 killer was an avian-like influenza from an unknown source and experts believe that the virus was formed by spontaneous mutations.⁴⁸

The process by which influenza reinvents itself each year and that allows it to cross species is called reassortment.⁴⁹ Reassortment occurs when two different viruses, say a human virus and a bird virus, infect the same cell of an animal host.

While these two bugs are growing in the infected cell, they can exchange particles and take on the characteristics of each other and cross species; this process is exactly what started the flu epidemics of 1957 and 1968.^{50 51} There is, however, another method of change that is called adaptation. Adaptation is a process where spontaneous mutations occur at random in a virus resulting in a new bug with potentially more serious consequences.⁵² Adaptation is what Taubenberger's work suggests happened in 1918. Adaptation is the most troubling evolutionary process of a virus because the resultant product may be quite novel and contagious. Since potential victims would not have had an opportunity to be exposed before, there would be little or no immunity in the population. Such a scenario is a set up for widespread disease.

The usual approach to influenza is to make a vaccine using the current strain as soon as it is isolated early in the influenza season. Some help can be obtained from the prior year's bug, but due to the genetic shifts that are a normal part of the evolutionary change of the influenza virus, the previously vaccine will have little, if any, potency for the new strain. Current technology requires the use of eggs to produce vaccine and the process is long, labor intensive, and expensive.^{53 54} The manufacturing process is essentially the same one that has been used for nearly 50 years.⁵⁵ Another problem with flu vaccine production is the relatively low profit margin and potential huge liability costs associated with production.⁵⁶ Further compounding the production problem is the inability to predict the need for the product. In some years, there is not enough to respond to the demand and in other years thousands of doses are wasted at the end of the season. Again, the shelf life of the vaccine is essentially one season due to the genetic shift that occurs annually in the virus. Finally, the numbers of manufactures that make the vaccine are indeed small and they are frequently located outside the

boundaries of the U.S.⁵⁷ The lack of factories on American soil could pose a serious security issue if nations suddenly nationalized their ability to produce vaccine in the threat of a pandemic.⁵⁸

The U.S. Food and Drug Administration approved the first U.S. vaccine for humans against H5N1 on 17 April 2007 and the avian influenza virus and that vaccine will be manufactured in the U.S.⁵⁹ The bad news is that the vaccine was only tested on 400 healthy volunteers and less than half of those who got the highest dose had a level of antibody against the flu that would, "...reduce the risk of getting influenza."⁶⁰ While this certainly represents progress it does not approximate the needed effective treatment. The vaccine, however, is not widely available and is not for sale. It is being made only for the U.S. government and distribution will occur only if public health officials determine it is needed. The rationale, spelled out in an accompanying question and answer pamphlet, candidly notes that the U.S. does not have the production capacity to make enough vaccine quickly enough for the population. The pamphlet continues that the vaccine will be available when needed for "...those who are designated as priority recipients..."⁶¹ There is no information on who those "priority recipients" will be or on how they will be chosen. And finally, the vaccine is only to be used in patients 18-64 years of age. Again, progress, but not nearly enough in the process of preparing for potential pandemic.

Oral anti-viral agents like Tamiflu (oseltamivir) and Relenza (rimantadine) are approved by the FDA for prevention of influenza A and B in individuals who have been exposed.⁶² The good news is that these agents, at least experimentally, are thought to have some effect on a potential pandemic flu virus. The bad news is that these drugs must be taken early, within 24-48 hours of exposure, have significant side effects

including the possibility of “self injury” and they are expensive.^{63 64} Current orders for Tamiflu have exceeded the manufacturers’ ability to supply the agent and current supply lines are back ordered for national strategic stockpiles.⁶⁵ The drug is available, but it is costly and in short supply.⁶⁶ Further, the usual dose regimen is for short term treatment of only a few days as the expectation is that an individual will not be re-exposed to the virus on any continuing basis. In a pandemic, the need for continued use of these agents would further complicate efforts to use them for the public at large and the longer the agents are used, the more potential there would be for intolerable side effects and development of resistance. Finally, the use of these agents does not provide immunity; only a vaccine causes the human to produce antibodies that then offer protection against infection.

The threat of pandemic flu is quite real. Many experts argue that the question is not “if,” but “when” the next pandemic will occur.⁶⁷ The rub, of course, is trying to predict the unpredictable. Just such a scenario has occurred before and that episode may be one of the many reasons why the U.S. has not moved further along the road to have a more robust pandemic plan in place.

Early in 1976 an 18 year old Army Private collapsed at Fort Dix, New Jersey, after a basic training exercise that involved a forced march in a hard New England winter. An autopsy on Private David Lewis revealed that this young soldier died of something the researchers called swine flu.⁶⁸ Laurie Garrett quotes then Secretary of Health, Education and Welfare David Matthews as saying, “There is evidence there will be a major flu epidemic this coming fall. The indication is that we will see a return of the 1918 flu virus that is the most virulent form of flu.”⁶⁹ He continued, “The projections are that this virus will kill one million Americans in 1976.”⁷⁰ Then, as now, many experts

believed that the world was ripe for a flu pandemic. Garrett describes the divergence of professional opinion and the differing international views. In the end, President Ford made a national address in March of 1976 concluding that the threat was real and asking Congress for a large appropriation to finance enough vaccine production to inoculate all U.S. citizens. The cry from industry was that they would need special liability protection, which Congress provided, and indeed there were over \$3 billion dollars in claims against the government over side-effects.⁷¹ And, after all that, the swine flu just fizzled out.

Regardless of divergent opinions, there is general consensus that a pandemic is a very real threat.^{72 73} There is general consensus that the numbers of people who could become infected may be enormous, that regardless of the final effect of the pandemic in terms of lives lost, the effect on worker productivity and the global economy will be devastating, that the current ability to produce adequate vaccine does not exist, that anti-viral medications will probably be helpful but are in short supply, and that international relations will be strained as nations restrict travel, imports, and international commerce.^{74 75 76 77} And finally, there is general consensus that the world's medical system will be overwhelmed.^{78 79 80 81}

One major problem for medical facilities will be the numbers of patients. Currently in the U.S. there has been a wave of consolidation of health care providers into large centralized systems, very much like that in countries that have national health care. The idea behind such moves is that big hospitals can provide more efficient and sophisticated care at a lower cost. In some cases the idea has worked, but the trade off is an often a backlog of cases and procedures which tends to impose limits on patient's choice of facility. In a pandemic, such centralization could be problematic due to the

lack of availability of care in small communities and potential problems associated with quarantine of active cases.

In a national emergency such as pandemic, it is presumed by most planners that healthcare personnel will receive vaccine if available on a priority basis. Given current production capability, however, it is unlikely that any community would be able to vaccinate all the doctors, nurses, and ancillary personnel needed to keep the community health care centers open and operating with peak efficiency. Most envision the need for emergency wards or hospitals being set up and staffed by locals at gymnasiums, sports arenas, and even parking lots. Due to the projected 12-36 month length of a pandemic, the availability of health care providers will be, without question, inadequate.

In the event of a pandemic, health care services will not be the only community service affected. Fire, police, local governmental personnel, the mail services, the grocer, butcher, and even the gas station owner will be at risk. Consequently, it is rather probable that many essential community services will be seriously degraded and in some cases will simply be absent.

There is some good news among all the gloom and doom however. Nations all over the world, private industry, and the U. S. government have started planning for a potential pandemic.^{82 83 84 85} The World Health Organization web site provides a template for pandemic planning.⁸⁶ The Centers for Disease Control and Prevention, National Institutes of Health, the Department of Health and Human Services, and the White House all have web sites with details on pandemic potential, pandemic prevention, and pandemic planning.^{87 88 89 90 91} These plans are detailed, available freely, and have been widely disseminated among government leaders at the federal,

state, and local levels. The CDC even has a detailed check list for business planning to prepare for possible pandemic flu.⁹²

Good news is present in the pandemic story. But, like all coins, there are two sides and side two is best represented by the comments of Professor Bert Tussing at the Army War College when he discusses strategies for Homeland Security.⁹³ After all the forgoing discussion it must be imminently clear that pandemic flu represents a clear risk to homeland security and when a strategy is being developed to protect the homeland, pandemic planning must be addressed. Professor Tussing notes that strategy is not as intuitive as it may seem; that strategy remains elusive to some, that some would rather not have a strategy and that finally strategy is needed by all. Tussing's guiding principles for a homeland security strategy include protection of rights and values, an all hazard approach, risk management, accountability, utilization of new technology, teamwork, flexibility, and development of trust through collaboration and partnerships. Tussing's focus on unity of effort and emphasis on exercises at multiple levels will be key factors in helping the U.S. develop and mature plans for pandemic response.

The concept of unity of effort will clearly extend across the spectrum to include local, state, and national players and must include the private sector as well. Planners typically think of including governmental officials, law enforcement, and the military. Often however, business is left to fend on its own and usually wants to be left alone. But, it is paramount to realize that much of the critical infrastructure of this nation is provided not by the government, but by private business.⁹⁴ The list is almost endless, but includes transportation, telecommunications, manufacturing, and healthcare among others. It is even more sobering to realize that even the government often depends on

private business. So, business may be one of the players that Tussing would describe as not wanting strategy, but they clearly need it and so does the nation at large.

The National Strategy for Pandemic Influenza is an impressive document and presents a reasoned and well designed national strategy for dealing with the potential of a flu pandemic.⁹⁵ The document is well written and presents the three pillars of national strategy as preparedness and communication, surveillance and detection, and finally response and containment. The major weaknesses in the plan seem to be in dealing with production and stockpiling of vaccines, antivirals and medical material, establishing priorities of use for limited agents, and a huge reliance on state and local governments, business, and the population at large to effectively cooperate with and implement national plans and strategy in the event of pandemic.

The pandemic strategy purposefully does not attempt to catalogue and assign all federal responsibilities and it does not offer strict formulae for implementation. Some may consider these to be weaknesses, but on the contrary they represent strengths. For any plan to adequately deal with a complex and potentially catastrophic event that cannot be researched in a controlled environment, flexibility and resilience are key components necessary to increase the probability of success.

While the basic plans in place and the early planning and continued work are clear positives, much more needs to be done. Of the many agenda items that will move pandemic planning forward, the following elements should be addressed initially. First, the U.S. must invest in more modern techniques of vaccine production that are safer, faster, and less expensive than the 50 year old technology currently in place today. The ability to produce such vaccine, and oral antiviral agents, within the contiguous U.S. should be considered a critical capability for national security and nationwide

vaccination for preventable illnesses should be reemphasized. As a follow on to the vaccine research and development, delivery methods such as skin patches, inhaled and oral forms of drug should be pursued as technology allows. Such delivery systems make lay administration of life saving medicine much easier and effective.

Second, the U.S. should educate health professionals and the lay public in the best methods for prevention, early detection, containment, and treatment of infectious disease. The Public Health services of this nation, medical schools, and local communities should be given the assets needed to teach and treat as needed, much as was the case in previous threats such as polio and smallpox. Relatively few physicians, nurses, and physician assistants have had any experience with a highly contagious and deadly infectious disease occurring in pandemic proportions in an environment where many of the usual medical support systems are failing or non-existent. Learning to practice in such an environment would greatly benefit the national health workforce and their patients. Teaching potential patients how to provide care at home would reduce the burden on what will be an overtaxed medical system and will have the added positive effect of reducing disease spread by keeping many patients at home.

Third, the U.S. must partner with other nations and international organizations to help implement a global approach to pandemic. Infectious disease does not recognize borders, race, religion, or ethnicity. To think that any nation could combat a global pandemic alone is to fail to understand the potential scope of such an event. International stockpiles of drugs and vaccines, mobile medical units, disease surveillance, and cooperation in limiting contagion will be of enormous benefit and could potentially prevent an epidemic from becoming a pandemic. Planning for continued international commerce and addressing issues of limiting population movements and

possible quarantine must be discussed in pre-event planning. Planning for civil-military cooperation on an international scope is essential.

Finally, this nation must practice dealing with a national healthcare emergency. All of the planning to date will be for naught if there has been no attempt to put the options into play. War gaming a pandemic will help develop and modify plans to better assist this nation in protecting its citizens should the unthinkable occur. The potential complexities of command and control, communications, logistics, and constitutional issues are best considered in the planning environment and the benefits will be great. Dealing with the “turf battles” now will enhance the effectiveness of response in a true emergency. And finally, remembering the usual threats from human aggressors and maintaining an effective fighting force to deter and if needed defeat an aggressor is paramount. Any After Action Review of such an event will not look kindly on those who spent time talking while citizens were suffering and the nation’s security was put at further risk.

Some will say that such planning and effort will be wasted because a pandemic like the 1918 flu will never occur again. Those naysayers may be correct, but such thinking is not prudent. Even so, if the planning for pandemic flu is flexible and resilient, the template can be expanded to cover almost any contingency. For a localized emergency such as a terrorist attack or a natural disaster like a hurricane, the planning and practice is designed to provide assistance and security wherever needed in the homeland. Such planning could even help when providing assistance to others internationally as a token of good will from the people of the U.S.

At the end of the PBS program on the 1918 influenza there is a poignant segment with an elderly gentleman who was just a boy during the event. The camera

angle shows him slightly from the side as he speaks to an interviewer out of view. He tells the story of learning of his mother's death from the flu and of his life afterwards.

The old fellow notes that after her death, "The shine went out of everything."⁹⁶

Suddenly, the reality of the 1918 pandemic becomes clear as the elderly gentleman notes that his most profound realization after the flu was, "We were not safe."⁹⁷

Just as in 1918, the U.S. is not safe. There are many warning signs afoot that the potential for pandemic flu is real and the consequences could be devastating. While this great nation has taken many positive steps to mitigate the risk of such an event, much more needs to be done and it needs to be done promptly. Even if the threat never comes to fruition, the efforts expended in planning and practice will have wide applicability to other threats and the net effect will be an enhanced homeland security strategy and a safer America.

Endnotes

¹ Jeffery K. Taubenberger and David M. Morens, "1918 Influenza: the Mother of All Pandemics," *Emerging Infectious Diseases* January 2006; available from <http://www.cdc.gov/ncidod/EID/vol12no01/05-0979.htm>; Internet; accessed 09 April 2007. Dr. Taubenberger is Chairman of the Department of Molecular Pathology at the Armed Forces Institute of Pathology and Dr. Morens is an epidemiologist at the National Institute of Allergy and Infectious Diseases.

² David M. Morens and Anthony S. Fauci, "The 1918 Influenza Pandemic: Insights for the 21st Century," *The Journal of Infectious Diseases*, 195 (2007):1018-28. Both authors are at the National Institute of Allergy and Infectious Diseases, a component of the National Institutes of Health and Dr. Fauci is Director of NIAID.

³ Alfred W. Crosby, *America's Forgotten Pandemic The Influenza of 1918 New Edition* (Cambridge University Press New York; 2003), 206. This work is the standard reference for readers interested in the 1918 pandemic. As George Santayana noted, "Those who cannot remember the past are condemned to repeat it." Dr. Crosby wonders about the strange lack of memory among Americans concerning the 1918 Pandemic. His book, much like the flu in 1918, has had three waves of interest. The work was originally published in 1976 primarily as a work of historical fact detailing the pandemic. A recurrence of interest was expressed in 1989 when concern about infectious disease resurfaced with the AIDS epidemic. And the current edition of 2003 was published due to concern about SARS and the potential of H5N1 pandemic. Dr. Crosby is a Professor Emeritus in American Studies, History, and Geography at the University of Texas at Austin.

⁴ John G. Bartlett, "Planning for Avian Influenza," Annals of Internal Medicine, 145 (18 July 2006): 2.

⁵ Michael Osterholm, "Preparing for the Next Pandemic," July/August 2005; available from <http://www.foreignaffairs.org/20050701faessay84402/michael-t-osterholm/preparing-for-the-next-pandemic.html>; Internet; accessed 08 April 2007. Michael T. Osterholm, PhD, MPH is director of the Center for Infectious Disease Research and Policy and is a professor in the School of Public Health at the University of Minnesota. He is known internationally for his work in the area of pandemic planning for influenza. This article is sobering. This article and the follow on article from March/April 2007 are excellent commentaries by a very knowledgeable individual.

⁶ Ibid.

⁷ George W. Bush, National Strategy for Pandemic Influenza (Washington, D.C.: The White House, November 2005), 1-12.

⁸ John V. Basmajian et al., eds., Stedman's Medical Dictionary (Baltimore: Williams & Wilkins, 1982), 474.

⁹ Ibid., 1020.

¹⁰ Morens and Fauci, 1018-1028.

¹¹ Crosby, 17-200.

¹² PBS Home Video, INFLUENZA 1918, 60 min., Robert Kenner Films for American Experience, 1998 WGHB, Boston, DVD. An excellent program that puts a human face on one of history's most troubling times.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ Centers for Disease Control and Prevention, "Researchers Reconstruct 1918 Pandemic Influenza Virus; Effort Designed to Advance Preparedness," 05 October 2005; available from <http://www.cdc.gov/od/oc/medic/pressrel/r051005.htm>; Internet; accessed 09 April 2007.

¹⁹ Molly Billings, "The Influenza Pandemic of 1918," June 1997, modified February 2005; available from <http://virus.stanford.edu/uda/index.html>; Internet; accessed 09 April 2007. This website offers an excellent general overview of the 1918 pandemic. Included is a letter from a physician working at an Army hospital. The details in the letter are chilling with descriptions of men dying quickly and in large numbers with doctors powerless to stem the tide of death.

²⁰ Ibid.

²¹ Ibid.

²² Ibid.

²³ Taubenberger and Morens.

²⁴ Billings.

²⁵ Isaac Starr, "Influenza in 1918: Recollections of the Epidemic in Philadelphia," Annals of Internal Medicine, 145 (18 July 2006): 2. This essay is a chilling first person accounting of the pandemic with potential lessons for current day planners and skeptics.

²⁶ PBS Home Video.

²⁷ Ibid.

²⁸ Ibid.

²⁹ Ibid.

³⁰ Starr, 140.

³¹ Ibid.

³² Crosby, 311.

³³ Osterholm, "Preparing for the Next Pandemic,".

³⁴ Laurie Garrett, "The Next Pandemic?," July/August 2005; available from <http://www.foreignaffairs.org/20050701faessay84401/laurie-garrett/the-next-pandemic.html>; Internet; accessed 08 April 2007. Garrett is a Senior Fellow for Global Health at the Council on Foreign Relations.

³⁵ National Intelligence Council, "Mapping the Global Future: Report of the National Intelligence Council's 2020 Project," December 2004; available from http://www.dni.gov/nic/NIC_2020_project.html; Internet; accessed 19 April 2007. The NIC states flatly that a pandemic could "STOP" globalization! In this referenced document, the NIC notes that a major global conflict could also stop globalization, but the report considers the likelihood of a major conflict remote. Pandemic in the huge metropolises of the third world with poor infrastructure and limited health care would make them hot beds of disease and the numbers of deaths could be staggering. The destabilization of the regions rife with disease would encourage refugees to flee to any available safe haven, thereby further spreading the infection and perhaps triggering military responses from other nations attempting to limit travel and quarantine diseased areas.

³⁶ Michael Osterholm, "Unprepared for a Pandemic," Foreign Affairs, 86 (March/April 2007):47-57. Here is another sobering commentary from Dr. Osterholm. He again warns of the storm clouds on the horizon, notes the inadequate planning done to date, discusses the inevitability of pandemic, and makes suggestions to help improve pandemic planning.

³⁷ Osterholm, "Preparing for the Next Pandemic,".

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² Garret.

⁴³ Osterholm, "Preparing for the Next Pandemic,".

⁴⁴ Ibid.

⁴⁵ Garrett.

⁴⁶ National Institutes of Health, "Review of 1918 Pandemic Flu Studies Offers More Questions than Answers," 28 February 2007; available from <http://www.nih.gov/news/pr/feb2007/niaid-28.htm>; Internet; accessed 09 April 2007.

⁴⁷ Taubenberger and Morens.

⁴⁸ Ibid.

⁴⁹ Osterholm, "Unprepared for a Pandemic," 47-48.

⁵⁰ Ibid.

⁵¹ William B. Karesh and Robert A. Cook, "The Human-Animal Link," July/August 2005; available from <http://www.foreignaffairs.org/20050701faessay84403/william-b-karesh-robert-a-cook/the-human-animal-link.html>; Internet, accessed 08 April 2007. This article is an excellent review of why animal health is critically linked to the safety of humans and why large factory farms where many animals are slaughtered could serve as the potential nexus for disease outbreak. Dr. Karesh is Director of the Field Veterinary Program at the Wildlife Conservation Society and Dr. Cook is the Chief veterinarian of the same group.

⁵² Osterholm, "Unprepared for a Pandemic," 48.

⁵³ Ibid., 53-54.

⁵⁴ John J. Treanor et al., "Safety and Immunogenicity of a Baculovirus-Expressed Hemagglutinin Influenza Vaccine: A Randomized Controlled Trial," Journal of the American Medical Association, 297 (11 April 2007): 14. Ongoing research to produce vaccine in new ways; this group used recombinant baculoviruses in insect cells to produce vaccine. Early results are encouraging, but this was a small study in only 460 adults. Any therapy that would be considered for a large number of patients, such as a flu vaccine, must be carefully evaluated as a very small risk of side effect could result in many harmed patients when the number vaccinated is large.

⁵⁵ Ibid.

⁵⁶ Garrett.

⁵⁷ Osterholm, "Preparing for the Next Pandemic,".

⁵⁸ Garrett.

⁵⁹ U.S. Food and Drug Administration, "FDA Approves First U.S. Vaccine for Humans Against the Avian Influenza Virus H5N1," 17 April 2007; available from <http://www.fda.gov/bbs/topics/NEWS/2007/NEW01611.html>; Internet; accessed 18 April 2007. Production of adequate supplies of vaccine for the population of the U.S. is still a bridge too far; this nation does not have the industrial capacity for production and the problem is further compounded by the lack of knowledge as to just which antigenic strain is needed to combat the final form of the virus that causes the disease. Essentially, scientists can't make the vaccine until they isolate the actual infectious agent and then culture and grow it to make the vaccine. So, even if the new vaccine is effective, there is no guarantee that the virus that causes the pandemic will be identical to the agent that was used to prepare the vaccine. Further, the ethical dilemmas surrounding the prioritization of who should get vaccine are complex and have not been discussed openly in public forums.

⁶⁰ Ibid.

⁶¹ Ibid.

⁶² U.S. Food and Drug Administration, "Patient Information Sheet Oseltamivir Phosphate (marketed as Tamiflu)," 12 December 2006; available from http://www.fda.gov/cder/drug/InfoSheets/patient/oseltamivir_phosphatePIS.htm; Internet; accessed 20 April 2007. An effective drug, but with significant potential pitfalls that include side effects, costs, and supply/distribution difficulties.

⁶³ Ibid.

⁶⁴ Ahmet Faik Oner et al., "Avian Influenza a (H5N1) Infection in Eastern Turkey in 2006," The New England Journal of Medicine, 355 (23 November 2006): 21. This outbreak only infected 8 patients, but the fatality rate was 50 percent; four patients died. Further, the enzyme-linked immunosorbent assay (ELISA) and rapid influenza tests were negative in all patients. The diagnosis was made by a polymerase-chain-reaction (PMR) assay. The point is that the diagnosis was difficult and the usual flu tests did not yield the answers. One of the most important tools in controlling potential pandemic is early and prompt diagnosis. This experience implies that doing so may be very difficult and therefore infection would be more likely to spread while attempts were being made to diagnose the illness. Further, the use of oral antiviral agents in late diagnosis would be of little use as these agents are prophylactic and not therapeutic.

⁶⁵ Osterholm, "Preparing for the Next Pandemic,".

⁶⁶ Ibid.

⁶⁷ Bush, 1.

⁶⁸ Garrett.

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² Bush, 1-2.

⁷³ American College of Physicians, "The Health Care Response to Pandemic Influenza," Annals of Internal Medicine, 145 (18 July 2006): 2. This article is a position paper by the American College of Physicians with a call to arms to prepare for pandemic.

⁷⁴ Osterholm, "Unprepared for a Pandemic," 55-56.

⁷⁵ Garrett.

⁷⁶ Bush, 1-12.

⁷⁷ National Institutes of Health.

⁷⁸ Ibid.

⁷⁹ World Health Organization, "Epidemic and Pandemic Alert and Response," available from <http://www.who.int/csr/disease/influenza/pandemic/en/>; accessed 09 April 2007. This site offers the WHO plans for pandemic and links to other references.

⁸⁰ Garrett.

⁸¹ Osterholm, "Preparing for the Next Pandemic,".

⁸² Policy Forum: "Pandemic Influenza Preparedness in North Carolina," North Carolina Medical Journal, January/February 2007, 68:1. This policy forum starts with the ethics of management of pandemic, reviews vaccine production, legal issues, hospital roles in pandemic and reviews business preparation for pandemic. There is even commentary from a retired MG of the ARNG. North Carolina is taking pandemic preparation seriously and the medical community is leading the way.

⁸³ Osterholm, "Unprepared for a Pandemic," 51-52.

⁸⁴ Bush, 1-12.

⁸⁵ World Health Organization.

⁸⁶ Ibid.

⁸⁷ Ibid.

⁸⁸ National Institutes of Health.

⁸⁹ Centers for Disease Control and Prevention, "Business Pandemic Influenza Planning Checklist," 20 October 2006; available from <http://www.pandemicflu.gov/plan/businesschecklist.html>; Internet; accessed 09 April 2007. This CDC portal offers a complete reference site on governmental planning and recommendations as well as updates on international issues pertaining to potential pandemic flu.

⁹⁰ The White House, "National Strategy for Pandemic Influenza," 01 November 2005; available from <http://www.whitehouse.gov/homeland/pandemic-influenza.html>; Internet; accessed 09 April 2007.

⁹¹ U.S. Department of Health and Human Services, "Know What to do About Pandemic Flu," available from <http://www.pandemicflu.gov/>; accessed 09 April 2007.

⁹² Centers for Disease Control and Prevention, "Business Pandemic Influenza Planning Checklist,".

⁹³ Bert Tussing, "Strategic Plans and the Department of Homeland Security," lecture, Carlisle Barracks, PA, U.S. Army War College, 07 November 2006, cited with permission of Professor Tussing. Professor Tussing was most gracious in allowing his work to be quoted in this paper. The concepts expressed in his lecture are critical components that must be addressed in any effective contingency planning for pandemic.

⁹⁴ Osterholm, "Unprepared for a Pandemic," 56.

⁹⁵ Bush, 1-12.

⁹⁶ PBS Home Video.

⁹⁷ Ibid.

